Center Innovation Fund: AFRC CIF

Investigation of a Fiber Optic Strain Sensing (FOSS) Distributed Load Calibration Methodology

Completed Technology Project (2015 - 2016)

Project Introduction

FOSS is a relatively newer technology that needs to be explored for application to load calibration and loads monitoring efforts. Load calibration opportunities are rare and typically expensive. MQ-9 wing testing in FLL provides a rare opportunity to advance the sate of the art in aircraft load calibrations. Instrument a MQ-9 wing with FOSS and conventional strain gages to measure wing shear, bending moment, torque and section properties along the span. Perform a loads calibration of the wing to determine load equations for measuring wing shear, bending moment, torque, and section properties along the span. Demonstrate through test the viability of developing a more cost effective and faster method of doing wing loads calibration using FOSS technology by comparing a FOSS load calibration test to the traditional technique using conventional strain gages. Utilize existing partnership with KSC Launch Services Program (LSP) to define technology infusion plan to effectively transition real-time flight loads monitoring techniques from aeronautics to space applications.

Anticipated Benefits

Will result in seminal report documenting a more efficient method of performing an aircraft loads calibration test using FOSS technology, and a report documenting the optimal characteristics for an adequate loads calibration. Will result in an improved understanding of distributed aerodynamic loading, optimized process for aircraft structural loads calibrations for monitoring and controlling flexible, high aspect ratio wings and rocket bodies. A detailed understanding of the spanwise load distribution will be required for optimizing the aerodynamic performance of future aerospace structures (transport class aircraft with the objective of increasing the wing aspect ration while minimizing the additional weight, high aspect ratio flexible structures (wings for long endurance aircraft, launch vehicles and sounding rockets), space frame structures for solar sails)

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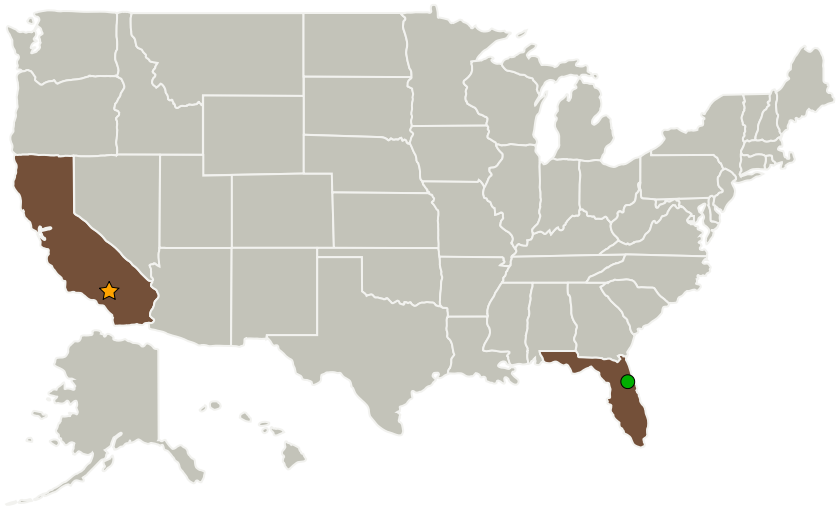
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
●Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
California	Florida

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Center Innovation Fund: AFRC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

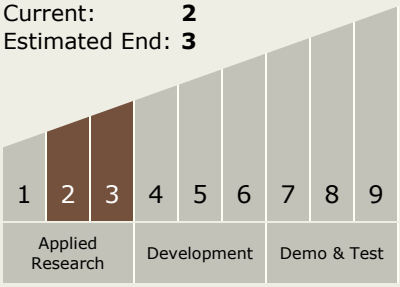
David F Voracek

Principal Investigator:

Eric M Miller

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity